



Republic of South Africa

EDICT OF GOVERNMENT

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SANS 6055 (2006) (English): Water –
Orthophosphate content



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Edition 2

SOUTH AFRICAN NATIONAL STANDARD

Water — Orthophosphate content

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Table of changes

Change No.	Date	Scope

Foreword

This South African standard was approved by National Committee SABS SC 147A, *Water – Water sampling and analysis*, in accordance with procedures of the SABS Standards Division, in compliance with annex 3 of the WTO/TBT agreement.

This standard was published in December 2006. This edition cancels and replaces the first edition (SABS SM 1055:1982).

**Reaffirmed and reprinted in March 2012.
This standard will be reviewed every five years and
either be reaffirmed, amended, revised or withdrawn.**

Water — Orthophosphate content

1 Scope

This standard specifies a method for the determination of the orthophosphate content of water and wastewater.

2 Normative reference

The following referenced document is indispensable for the application of this document. All normative documents are subject to revision and, since any reference to a normative document is deemed to be a reference to the latest edition of that document, parties to agreements based on this document are encouraged to take steps to ensure the use of the most recent edition of the normative document indicated below. Information on currently valid national and international standards can be obtained from the SABS Standards Division.

SANS 3696/ISO 3696, *Water for analytical laboratory use – Specification and test methods*.

3 Principle

Ammonium molybdate and potassium antimonyl tartrate react in acid medium with orthophosphate to form a heteropoly acid-phosphomolybdic acid, that is reduced to intensely coloured molybdenum blue by ascorbic acid.

4 Interference

Arsenates react with the molybdate reagent to produce a blue colour similar to that formed with phosphate. Concentrations as low as 0,1 mg/L As/L interfere with the phosphate determination. Hexavalent chromium and NO_2^- interfere to give results that are about 3 % low at concentrations of 1 mg/L and 10 % to 15 % low at concentrations of 10 mg/L. Sulfide (Na_2S) and silicate do not interfere at concentrations of 1,0 mg/L and 10 mg/L respectively.

5 Reagents

5.1 General

Unless otherwise specified, only use water that complies with the requirements for grade 3 water as given in SANS 3696, and reagents of analytical reagent grade.

5.2 Ammonium molybdate solution

Dissolve, with heating, 9,6 g of ammonium molybdate $(\text{NH}_4)_6\text{Mo}_7\text{O}_{24} \cdot 4\text{H}_2\text{O}$ in water. On cooling, dilute to 1 L with water.

5.3 Ascorbic acid

Dissolve 10 g of ascorbic acid powder in 80 mL of water and dilute to 100 mL. Store in a refrigerator and make up a fresh solution on the development of a noticeable colour.

5.4 Sulfuric acid solution

Slowly add 112 mL of concentrated sulfuric acid to 800 mL of water. After cooling, dilute to 1 L with water.

5.5 Tartrate solution

Dissolve 2,66 g of potassium antimony tartrate ($\text{KSbO}\cdot\text{C}_4\text{H}_4\text{O}_6$) in 1 000 mL of water.

5.6 Mixed reagent

Prepare 140 mL of a mixed reagent by combining (in the order given and mixing well after the addition of each reagent) the following, ensuring that each reagent is at room temperature when added:

50 mL of the sulfuric acid;
20 mL of the tartrate solution;
50 mL of the ammonium molybdate solution; and
20 mL of the ascorbic acid.

NOTE The mixed reagent is stable for 4 h.

5.7 Standard phosphate solutions

5.7.1 Stock phosphate solution

Dissolve in water 0,439 3 g of potassium dihydrogen phosphate (KH_2PO_4) that has been dried in an oven at approximately 105 °C. Dilute the solution to 1 000 mL with water. 1,00 mL of this solution contains 0,100 mg of phosphorus.

5.7.2 Working phosphate solution

Dilute 100,0 mL of the stock phosphate solution to 1 000 mL with water. 1,00 mL of this solution contains 10 µg of phosphorus.

6 Apparatus

6.1 Glassware, acid-washed.

6.2 Spectrophotometer, for use at 890 nm.

7 Procedure

7.1 Preparation of standard curve

7.1.1 Dilute portions of the standard phosphate working solution to obtain standards over the range of 1µg to 100 µg of phosphorus. Treat each solution and also a blank standard containing no phosphorus as described in 7.1.2 and determine the photometer absorbance reading against a

blank of water. Test at least one standard with each set of samples, or once each day that tests are done. Obtain the standard curve by plotting the absorbance against the mass of phosphorus.

7.1.2 Take 50 mL of the sample or, if estimated to contain more than 150 µg/50 mL, take a suitable aliquot of the sample and dilute to 50 mL. Add 14 mL of the mixed reagent and shake. After at least 10 min measure the absorbance photometrically at 890 nm. In the case of standards for calibration, the final volume of the standards shall be 50 mL.

NOTE Natural colour of water generally does not interfere at the high wavelengths used. For highly coloured or turbid water, a blank can be prepared by adding all reagents except ascorbic acid and potassium antimonyl tartrate to the sample. Subtract blank absorbance from absorbance of each source to correct for turbidity and colour interference.

7.1.3 Use the standard curve to obtain the mass, in micrograms, of orthophosphate in the sample aliquot (expressed as P).

8 Calculation

Calculate the phosphate content P , in milligrams per litre, of the sample taken, as follows:

$$P = \frac{m}{V} \times DF$$

where

m is the mass of phosphorus in the sample aliquot, in micrograms;

V is the volume of the sample aliquot, in millilitres;

DF is the dilution factor (50 mL/volume of sample taken in millilitres) to be used in the case of a sample that has more than 150 µg/50 mL phosphate.

NOTE In the case of the standards, $DF = 1,0$.

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SABS – Standards Division

The objective of the SABS Standards Division is to develop, promote and maintain South African National Standards. This objective is incorporated in the Standards Act, 2008 (Act No. 8 of 2008).

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South African National Standards are updated by amendment or revision. Users of South African National Standards should ensure that they possess the latest amendments or editions.

The SABS continuously strives to improve the quality of its products and services and would therefore be grateful if anyone finding an inaccuracy or ambiguity while using this standard would inform the secretary of the technical committee responsible, the identity of which can be found in the foreword.

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